REMARKS

Claims 12-16, 18-21, and 23-35 are pending in this application. Claims 12-16, 18-21, and 23-30 stand rejected as being unpatentable over US Pat. No. 6,756,131 (hereinafter Oguma), in view of US Pat. No. 6,514,046 (hereinafter Morrison). Applicants respectfully requests reconsideration of the rejections in view of the foregoing amendments and the following remarks.

Claims 12, 23 and 24 have been amended to emphasize aspects of the present invention. New claims 31-35 have been added. It is noted that new claim 35 essentially follows the recitations set forth in claim 1 of granted European Patent EP 1 466 079 B1, a European counterpart of the present application.

Claim 12 is directed to a gas turbine blade for a fourth stage and onward of a multi-stage turbine. The blade includes a root, platform and airfoil. The airfoil comprises at least a structural ceramic material for bearing a tensile load to oppose a centrifugal force that develops during rotation of the blade. The root, platform and airfoil are collectively made up of a plurality of materials in which at least 40% by volume of the materials comprise the structural ceramic material having a density of at most 4 g/cm^3, wherein the density by volume provided by the plurality of materials allows providing a length of at least 50 cm for a blade disposed in the fourth stage and onward of the multi-stage turbine. The basis for the foregoing amendment may be found at least in the abstract, and in paragraphs 6, 8, 25, 26, 33, 40, and claims 14 and 19 of the publication document of the present invention.

Applicant respectfully submits that the combination applied by the Examiner to reject claim 12 fails to teach or suggest the claimed invention. Oguma is directed to a high temperature corrosion resistant alloy, thermal barrier coating material. The Examiner correctly acknowledges that Oguma fails to disclose various structural and/or operational relationships set forth in claim 12. The Examiner then applies Morrison to purportedly correct such deficiencies. However, it is felt that Morrison if anything teaches away from the claimed invention. More particularly, the Office Communication states that Morrison has a ceramic shell to "bear substantially all of the thermal stress" and a metallic core to bear "almost all mechanical loading including aerodynamic

loading during operation" while reducing weight (citing the abstract of Morrison). However, this is directly opposite to the claimed invention wherein the airfoil comprises at least a *structural ceramic material* for bearing a tensile load to oppose a centrifugal force that develops during rotation of the blade. In Morrison the ceramic shell is used for bearing a thermal stress and not for bearing a tensile load to oppose a centrifugal force that develops during rotation of the blade.

In view of the foregoing, it is respectfully submitted that the obviousness rejection of claim 12 (and claims depending there from) should be withdrawn since none of the applied art (individually and in combination) teaches or suggests the specific structural and/or operational relationships that advantageously result in an improved gas turbine blade for at least the fourth stage and onward stages of a multi-stage gas turbine.

Regarding the rejection of claim 23, this claim is directed to a turbine blade for a fourth stage and onward of a multi-stage turbine. The blade includes a root portion connected to a rotor disk. The blade further includes an airfoil having a first section located adjacent to the root portion, wherein the first section comprises a material having a first density. The airfoil further has a second section located adjacent to the first section consisting exclusively of a structural ceramic material having a second density different than the first density and extending at least 80% of the length of the airfoil. The structural ceramic material bears a tensile load to oppose a centrifugal force that develops during rotation of the blade. At least 40% by volume of the first and second sections comprise the structural ceramic having a density of at most 4 g/cm^3, wherein the density by volume achieved over the first and second sections of the airfoil allows providing a length of at least 50 cm for a blade disposed in the fourth stage and onward of the multi-stage turbine.

Applicant respectfully submits that the Oguma/Morrison combination fails to render unpatentable the structural and/or operational relationships set forth in claim 23. For example, it is not believed that such a combination describes or suggests an airfoil having a second section (located adjacent to a first section) consisting exclusively of a structural ceramic material having a second density different than the first density and extending at least 80% of the length of the airfoil. Moreover, the structural ceramic material bears a tensile load to oppose a centrifugal force that develops during rotation

of the blade. In Morrison the ceramic shell is used for bearing a thermal stress and not for bearing a tensile load to oppose a centrifugal force that develops during rotation of the blade. Consequently, if anything Morrison teaches away from the claimed invention and this rejection should also be withdrawn.

Claim 24 is directed to a gas turbine blade for a fourth stage and onward of a multi-stage turbine. The blade is made up of at least one material in which at least 40% by volume of the material has a density of at most 4 g/cm^3. The density by volume achieved by the at least one material allows providing a length of at least 50 cm for a blade disposed in the fourth stage and onward of the multi-stage turbine. The at least one material bears a tensile load to oppose a centrifugal force that develops during rotation of the blade. Applicant respectfully submits that the Oguma/Morrison combination fails to render unpatentable the structural and/or operational relationships set forth in claim 24. For example, it is not believed that such a combination describes or suggests any blade made up of at least one material in which at least 40% by volume of the material has a density of at most 4 g/cm^3, wherein such at least one material bears a tensile load to oppose a centrifugal force that develops during rotation of the blade. In Morrison the ceramic shell is used for bearing a thermal stress and not for bearing a tensile load to oppose a centrifugal force that develops during rotation of the blade. Consequently, if anything Morrison teaches away from the claimed invention. Accordingly, the rejections of claim 24 (and claims depending there from) should also be withdrawn.

New independent claim 31 is directed to a gas turbine blade for a fourth stage and onward of a multi-stage turbine. The blade comprises a metallic root (34), and a platform (17) comprising a structural ceramic material (39) mechanically interlocked with the root. See Fig. 4. The platform ceramic material extends radially to form an airfoil, wherein the ceramic material bears a tensile load to oppose a centrifugal force that develops during rotation of the blade. Applicant respectfully submits that the Oguma/Morrison combination fails to render unpatentable the structural and/or operational relationships set forth in claim 31. For example, it is not believed that such a combination describes or suggests any blade comprising a structural ceramic material mechanically interlocked with the root, wherein the ceramic material bears a tensile load

to oppose a centrifugal force that develops during rotation of the blade. Accordingly, it respectfully submitted that claim 31 is allowable over the prior art of record, and should be so allowed.

Claim 32 further defines claim 31 by reciting that the metallic root comprises one or more affixing ribs at a first portion in correspondence with the platform for establishing the mechanical interlocking with the platform. See FIG. 4. Claim 33 further defines claim 32 by reciting that the metallic root further comprises a second portion extending radially through a portion of the airfoil. See FIG. 4. Claim 34 further defines claim 33 by reciting that the structural ceramic material comprises a volume of at least 40% of the airfoil volume, including the metallic root second portion therein, thereby reducing blade weight to provide a length of at least 50 cm for a blade disposed in the fourth stage and onward of the multi-stage turbine. Applicant respectfully submits that the Oguma/Morrison combination fails to render unpatentable the structural and/or operational relationships set forth in the parent claim as well as the structural and/or operational relationships respectfully recited in dependent claims 32 through 34. Accordingly, it respectfully submitted that claims 32-34 are also allowable over the prior art of record, and should be so allowed.

As noted above, new claim 35 essentially follows the recitations set forth in claim 1 of granted European Patent EP 1 466 079 B1, a European counterpart of the present application. Applicant respectfully submits that the Oguma/Morrison combination fails to render unpatentable the structural and/or operational relationships set forth in claim 35. Accordingly, it respectfully submitted that claim 35 is also allowable over the prior art of record, and should be so allowed.

Conclusion

For the foregoing reasons, it is respectfully submitted that the present claims comply with all applicable statutory requirements, and consequently are in form ready for allowance. Accordingly, applicant respectfully requests that the Examiner withdraw the rejections and timely pass the application to allowance.

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The commissioner is hereby authorized to charge any appropriate fees due in connection with this paper, including the fees specified in 37 C.F.R. §§ 1.16 (c), 1.17(a)(1) and 1.20(d), or credit any overpayments to Deposit Account No. 19-2179.

Respectfully submitted,

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